REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicants thank the Examiner for carefully considering this application and for the courtesies extended during the Examiner Interview of January 29, 2008.

Disposition of Claims

Claims 14 and 16-33 are pending in this application. Claims 14, 21, 27, 30 and 31 are independent. The remaining claims depend, either directly or indirectly, from claims 14, 21, 27, and 31.

Claim Amendments

Claims 21-26 is amended, as suggested by the Examiner, to recite "a computer readable storage medium encoding..." Applicants respectfully assert no new matter has been added by way of these amendments and no new search or consideration is necessitated by these amendments.

Rejection(s) under 35 U.S.C. § 101

Claims 21-26 are rejected under 35 U.S.C. § 101 as being directed to software per se. Claims 21-26 are amended, as suggested by the Examiner, to recite "a computer readable storage medium encoding of a shared object..." *See* Office Action dated December 13, 2007. A computer readable storage medium encoding of a data structure defines structural and functional interrelationships between the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory. *See* MPEP § 2106.01(I). Claims 21-26, as amended, are directed toward a computer readable storage medium encoding of a data structure

and therefore, comply with the statutory requirements of 35 U.S.C. § 101. Accordingly, withdrawal of this rejection is respectfully requested.

Rejection(s) under 35 U.S.C § 103

Claims 14 and 16-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "Skip Lists: A Probalistic Alternative to Balanced Trees" by William Pugh (hereinafter "Pugh") in view of U.S. Patent No. 6,651,146 (hereinafter "Srinivas"). This rejection is respectfully traversed.

"The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit." MPEP § 2143 (referring to *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 127 S. Ct. 1727 (2007). Further, when combining prior art elements, the Examiner "must articulate the following: (1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference; ..." MPEP § 2143(A). Further, "all words in a claim must be considered in judging the patentability of that claim against the prior art." MPEP § 2143.03.

Turning to the rejection of claims 14 and 16-33, Applicants assert that the references, whether viewed separately or in combination, fail to teach or suggest each and every limitation of independent claims 14, 21, 27, 30, and 31. Independent claim 14 recites, in part,

> operating on the shared data structure using insert-type and delete-type operations that are linearizable and lock-free for all concurrent executions thereof,
>
> wherein the *insert-type* operation performs a synchronized update of pointers

beginning at the first level thereof and continuing *upward*, and

wherein the *delete-type* operation performs a synchronized update of pointers beginning at a K^{th} level thereof and continuing *downward* to the first level.

Independent claims 21, 27, 30, and 31, recite similar limitations. In other words, claim 14 is directed toward a method of operating on a shared data structure using an insert-type operation and a delete-type operation that performs synchronized updates of pointers of the shared data structure *in opposite directions.* Specifically, the *insert-type* operations begin updating pointers at a first level of the referencing chains and continue *upward*, while the *delete-type* operations being updating pointers at a K^{th} level of the referencing chain and continue *downward* to the first level. Updating pointers in *opposite directions* allows for linearizable and lock-free concurrent executions of the insert-type and delete-type operations for skip lists. *See* Instant Specification, paragraphs [1059]-[1061].

As admitted by the Examiner, Pugh does not disclose an insert-type operation and a delete-type operation that update pointers in *opposite directions*. *See* Interview Summary dated February 1, 2008. Accordingly, Pugh also does not disclose linearizable and lock-free concurrent executions of the insert-type and delete-type operations for skip lists, as explicitly recited in the pending claims.

Specifically, Pugh teaches an insert operation that updates pointers beginning at level 1 and going upward. *See, e.g.,* Pugh, Figure 4 at lines 19-21:

```
for i:=1 to level do
    x→forward[i] :=update[i]→forward[i]
    update[i]→forward[i] :=x
```

Furthermore, Pugh teaches a delete operation that updates pointers in the *same direction as the insert operation, i.e.*, beginning at level 1 and going upward. *See, e.g.,* Pugh, Figure 4 at lines 32-34:

```
for i:=1 to list→level do
        if update[i]→forward[i] ≠ x then break
        update[i]→forward[i] := x→forward[i]
```

In other words, Pugh explicitly discloses insert operations and delete operations that update pointers in the same direction, which squarely contradicts the recited limitations of independent claim 14. Accordingly, the operations, as disclosed by Pugh, are not and cannot be equivalent to the operations recited by independent claim 14.

Furthermore, an insert operation and a delete operation that update pointers in the *same direction* in a skip list cannot be executed concurrently in a linearizable and lock-free manner because concurrently operating insert and delete operations without locks in a linearizable manner may lead to data inconsistencies. For example, an insert operation and a delete operation concurrently executing on the same node in the same direction, as disclosed by Pugh, may lead to data inconsistencies as each operation is not aware of other concurrent operations associated with the same node leading to overwritten inconsistent data in a single node. Therefore, in order to avoid data inconsistencies, skip lists with concurrently executing insertion and deletion operations with updates to pointers in the same direction, as taught in Pugh, requires implementation using locking mechanisms and/or are non-linearizable, squarely contradicting independent claim 14. A thorough review of Pugh reveals that Pugh is, in fact, completely silent regarding using an insert-type operation and a delete-type operation that performs synchronized updates of pointers *in opposite directions*, as recited in independent claim 14.

Srinivas does not teach or suggest what Pugh lacks as evidenced by the fact that the Examiner relies on Srinivas solely to disclose operating on a shared data structure using operations that are linearizable and lock-free for all concurrent operations. A thorough review of Srinivas reveals that Srinivas is completely silent regarding using an insert-type operation and a delete-type operation that performs synchronized updates of pointers *in opposite directions*, as recited in independent claim 14.

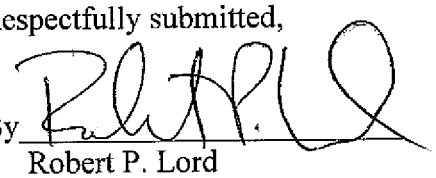
Thus, the combination of Pugh and Srinivas, whether considered separately or in combination, fail to render independent claims 14, 21, 27, 30, and 31 obvious. Claims 16-20, 22-26, 28, 29, 32, and 33 depend, either directly or indirectly, from claims 14, 21, 27, and 31, are patentable over Pugh, in view of Srinivas for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicants believe this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 33226/972001; P7982).

Dated: February 19, 2008

Respectfully submitted,

By 

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